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PATENT SPECIFICATION

DRAWINGS ATTACHED

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Inventor: SYDNEY HESLOP and ARTHUR FAULKNER.

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COMPLETE SPECIFICATION

Vehicles having liquid-cooled engines

We, THE ROVER COMPANY LIMITED, a British Company of Meteor Works, Solihull, Warwickshire, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to vehicles driven by liquid-cooled engines, especially though not exclusively road vehicles.

It is well known that, in an engine coolant circuit employing water or a water/glycol mixture as the coolant, impurities in the water can cause corrosion, especially of the coolant passages of the cylinder block but also in the coolant pump, the radiator, thermostat and connecting pipes. It is therefore usual for glycol and other antifreeze liquids to include corrosion inhibitor materials. These restrict corrosion and coat the exposed surfaces with a passive layer that at least to some extent protects the surfaces from 'agressive' waters. However, different inhibitors are required for different circumstances, depending on the materials employed, that is to say, an inhibitor suitable for cast iron cylinder blocks is not necessarily the best for use in engines with aluminium alloy cylinder blocks.

A further drawback of these inhibitors is that their life is limited and there is nothing to indicate to the user when they cease to become effective.

Where anti-freeze is not employed anyway, for example in warm climates, there is nothing to stop corrosion. It is known to be desirable to use demineralised water but in practice, especially in remote and underdeveloped areas, the user puts into the cooling circuit whatever water is available. The resulting corrosion problem can be serious and is particularly prevalent in those vehicles intended for use in rough and undeveloped country.

It has been proposed to incorporate in a bypass branch of the engine cooling circuit a water-conditioning filter unit which contains water-softening agents in the form of cationic ion exchange materials such as zeolites or ion exchange resins. Such a unit acts continuously to condition the coolant as the engine is running. The cationic exchange material is contained, together with a chromate, nitrate or other salt type of corrosion inhibitor, in a replaceable cartridge. Such a unit will remove the ordinary calcium and other metal ions that are responsible for the so-called 'hardness' but does nothing to inhibit acid attack. Materials which would do this cannot be used in the presence of chromate or other acid radical corrosion inhibitors which would themselves be absorbed by, and neutralise, such materials.

The aim of the invention is therefore to provide a unit of this kind which not only combats the deposit of the so-called 'hardness' scale but also resists acids, which are particularly troublesome where aluminium alloy components are present in the engine or in other parts of the cooling circuit.

According to the invention we propose to provide the cooling circuit of a vehicle driven by a liquid-cooled internal combustion engine with an ion exchange demineralising unit containing both cationic and anionic exchange resins. While the cationic resin takes care of the usual 'hardness', as in the previously proposed unit, the anionic resin neutralises any acid radicals present, such as chloride, sulphate and nitrate radicals. The demineralising unit may, according to a further feature of the invention, incorporate a sulphite or other

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de-oxygenating compound to remove dissolved oxygen from the coolant. Where a sulphite is used this becomes oxidised to the sulphate which is retained by the anionic exchange material.

The invention will now be described by way of example with reference to the accompanying drawings, in which Figure 1 is a diagrammatic illustration of a cooling circuit incorporating the demineraliser unit and Figure 2 shows a cross-section through the demineraliser unit itself.

With reference first to Figure 1, in the usual cooling circuit of an internal combustion engine E of a vehicle comprising a water pump P, thermostat T and radiator R, we incorporate a demineraliser unit D. To reduce to a minimum the danger of overheating the structure and materials of the unit, it is incorporated in the coolest part of the circuit, namely, the return from the bottom of the radiator R to the bottom of the cylinder block. Moreover, as a unit large enough to take the full coolant flow would have to be of substantial dimensions to avoid offering too much resistance to flow, we prefer to put the unit in a by-pass path, as shown, so that it takes only a fraction of the total flow.

The construction of the unit itself is shown in Figure 2. A bed of mixed resins 1 is disposed in a substantially cylindrical container moulded from synthetic resin, and is held in place by discs or layers of synthetic resin gauze 4 and 5 at the two ends. A filter of glass wool or similar material 6 is disposed at the input end of the container between the discs of synthetic resin gauze 3 and 4. The coolant, usually water, flows through the unit axially and its direction of flow is indicated by the arrow X.

As the water flows through the demineralising unit the glass wool filter collects any solid material which might tend to contaminate the exchange resins.

The water then flows through the mixed resins and the cationic exchange materials exchange metallic elements such as calcium and magnesium for hydrogen, whilst the anionic exchange materials exchange acid radicals such as sulphate and chloride for the hydroxyl group. Thus any calcium chloride or magnesium sulphate in natural water is exchanged for hydrogen and hydroxide i.e. hydrogen oxide which is water. In this way all the soluble compounds which create corrosive electrolytes are removed and the water is completely demineralised.

Although we have spoken above of the unit removing corrosive ions from water because that is where the prime need for it lies, it will be understood that the unit could be used equally well where the whole of the coolant is glycol or another non-ionic liquid; the unit will then serve to remove any ionic compounds present in it including glycolic acid, formic acid or other compounds formed by breakdown of the glycol.

Where glycol or other anti-freeze is added to water to form the coolant, the anti-freeze should be free from the normal inhibitors, which would saturate the exchange resins and render them inoperative.

In an alternative arrangement of the demineraliser unit, the mixed resins might be confined in a Terylene (Registered Trade Mark) nylon or glass fibre bag within the cylindrical container and thereby eliminate the discs 4 and 5.

The unit is preferably designed to be thrown away at the end of its life and replaced by a fresh one. In one typical example the unit is of a size that is capable of demineralising five gallons of the worst kind of water (other than sea water) that is likely to be encountered. If we allow a safety factor of 66% and assume that the circuit was initially filled with demineralised water and that the vehicle uses two thirds of a pint per thousand miles, this gives a life of 36,000 miles.

In a further example the use of a high quality water such as City of Birmingham mains supply used under the same conditions would give a life of not less than 100,000 miles.

WHAT WE CLAIM IS:—

1. A vehicle driven by a liquid-cooled internal combustion engine in which the cooling circuit of the engine contains an ion-exchange demineralising unit containing both cationic and anionic exchange resins to collect and retain corrosive ions present in the coolant.

2. A vehicle as in Claim 1 in which the demineralising unit also contains a sulphite or other deoxygenating compound.

3. A vehicle as in either of the preceding claims, in which the demineralising unit is a container moulded from synthetic resin which has the ion-exchange materials confined therein.

4. A vehicle as in Claim 4, in which the ion-exchange materials are confined between discs of gauze.

5. A vehicle as in Claim 5 in which the ion-exchange materials are confined in a bag within the container.

6. A vehicle as in any of Claims 3 to 5 in which a filter is fitted at the input of the demineralising unit.

7. A vehicle as in Claim 7 in which the filter is made from glass wool which is located between layers of synthetic resin gauze.

8. A vehicle as in any of the preceding claims and possessing a radiator, in the cooling circuit, in which the demineralising unit is connected in the main return pipe from

the bottom of the radiator or a by-pass thereof.

9. A vehicle driven by a liquid-cooled internal combustion engine substantially as herein described with reference to the accompanying drawings.

BARKER, BRETTELL & DUNCAN,
Agents for the Applicants,
Chartered Patent Agents,
16 Greenfield Crescent,
Edgbaston,
Birmingham 15.

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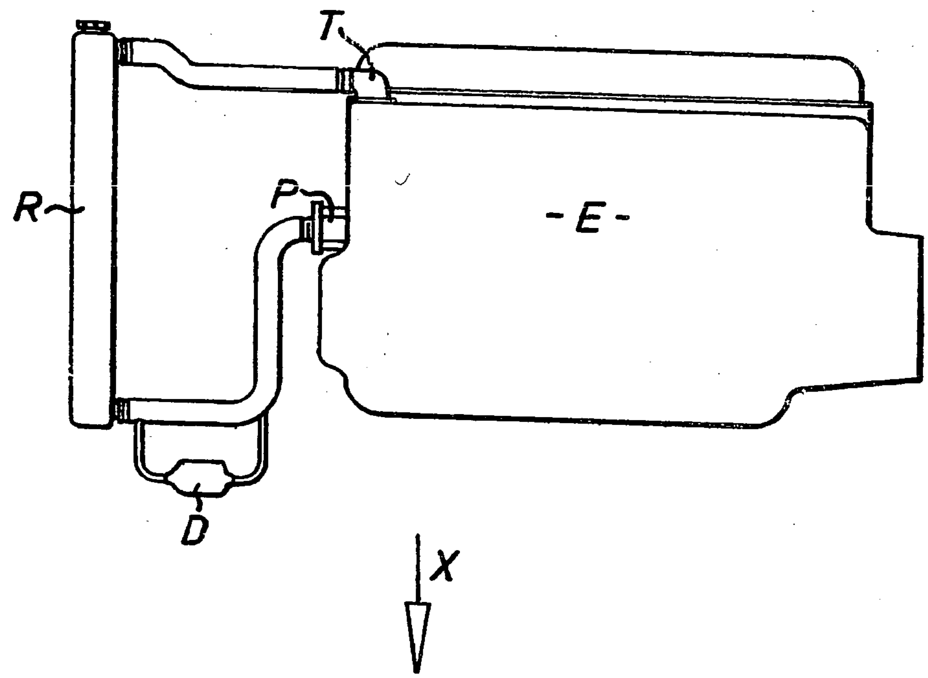
This drawing is a reproduction of the Original on a reduced scale.

Fig. 1.



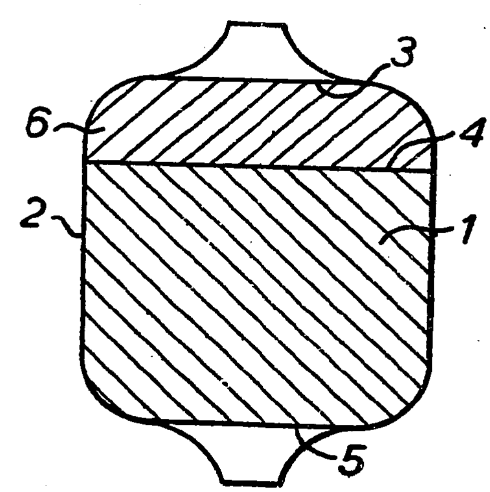


Fig. 2.

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